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CALIBRATION STANDARD REQUIREMENT

FOR A

SYNTHESIZED SIGNAL GENERATOR

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PROCUREMENT PACKAGE

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CALIBRATION STANDARD REQUIREMENT FOR A SYNTHESIZED SIGNAL GENERATOR

1. SCOPE

1.1 Scope. This requirement defines the mechanical, electrical, and electronic characteristics for a Synthesized Signal Generator. This equipment is intended to be used by Navy personnel in shipboard and shore based laboratories to calibrate various Weapon Test Sets and associated Test and Monitoring Systems (TAMS). For the purposes of this requirement, the Synthesized Signal Generator shall be referred to as the Generator.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment, General Specification for," and all documents referenced therein of the issues in effect on the date of the solicitation shall form a part of this requirement.

3. REQUIREMENTS

3.1 General. The Generator shall conform to Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased use as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The Generator shall operate from a source of 103.5V to 126.5V at 50 and 60 Hz 5% single-phase input power as specified in MIL-T-28800.

3.1.2.1 Fuses or Circuit Breakers. Fuses or circuit breakers shall be provided. If circuit breakers are used, both sides of the power source shall be automatically disconnected from the equipment in the event of excessive current. If fuses are used, only the line side of the input power line as defined by MIL-C-28777, shall be fused. Fuses or circuit breakers shall be readily accessible.

3.1.2.2 Power Connection. The requirements for power source connections shall be in accordance with MIL-T-28800 with a 6-foot (1.8 m) minimum length cord.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 10 inches (25.4 cm) in width, 7 inches (17.8 cm) in height, and 20 (50.8 cm)inches in depth. The weight shall not exceed 30 pounds.

3.1.4 Lithium Batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The Generator shall meet the environmental requirements for Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The Generator shall meet the conditions below:

	Temperature (°C)	Relative Humidity (%)
Operating	10 to 30	95
	30 to 40	75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE03, CS01, CS02, CS06, RE01, RE02 (14 kHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The Generator shall have a 85% or greater probability of remaining within tolerances on all requirements at the end of a 12 month period.

3.4 Maintainability. The Generator shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 60 minutes.

3.5 Performance Requirements. The Generator shall provide the following capability as specified below. Unless otherwise indicated, all requirements shall be met following a 30 minute warm-up period.

3.5.1 Frequency.

3.5.1.1 Frequency Range. The frequency range shall be from 10 Hz to 11 MHz.

3.5.1.2 Frequency Resolution. The frequency resolution shall be as follows:

Freq. Resolution	Frequency
0.1 Hz	<110 kHz
10 Hz	>110 kHz

3.5.1.3 Frequency Stability. The frequency stability shall not exceed $\pm 1 \times 10^{-8}$ per day at constant temperature, and not exceed $\pm 5 \times 10^{-7}$ over the temperature range of 10 to 40 degree C.

3.5.1.4 Frequency Uncertainty. The frequency uncertainty shall not exceed $\pm 1.5 \times 10^{-6}$ per year over the temperature range of 10 to 40 degree C.

3.5.2 Output Amplitude. The Generator shall provide output levels ranged from -55 dBm to +27 dBm minimum into 50 ohms. Selectable peak-to-peak or rms voltage terminated in 50 ohms or open circuit on the above range shall be provided.

3.5.2.1 Amplitude Resolution. The Generator shall have the amplitude resolution of 0.01 dB or better.

3.5.2.2 Uncertainty. The output amplitude uncertainty shall be better or at least equal to 0.15 dB over the entire amplitude range.

3.5.2.3 Flatness. The Generator frequency response at 0 dBm setting shall not exceed the following:

Flatness	Frequency Range
±0.02 dB	10 Hz - 50 Hz
±0.05 dB	50 Hz - 1 MHz
±0.08 dB	1 MHz - 11 MHz

3.5.3 Output Impedance. The output impedance of the Generator shall be a nominal 50 ohms.

3.5.4 Output Connector. BNC-type female output connector shall be provided.

3.5.5 Harmonic. The harmonics shall not exceed the following:

Harmonic	Frequency Range
-30 dBc	10 Hz - 100 Hz
-50 dBc	100 Hz - 1 MHz
-40 dBc	1 MHz - 11 MHz

3.5.6 Non-harmonic. The spurious signals shall be at least 60 dB below the carrier.

3.5.7 Phase Noise. The phase noise of the Generator shall be at least 46 dB below the carrier as measured in a 30 kHz bandwidth, and the residual shall be at least 50 dB below the carrier.

3.5.8 Amplitude Modulation (AM). The generator shall provide AM depth to 90 percent minimum at modulation rates up to 10 kHz.

3.5.9 Frequency Modulation (FM). The FM shall be as follows:

	<110 kHz	>110 kHz
Deviation	±200 Hz	±20 kHz
Uncertainty	±15 Hz	±1.5 kHz
Rate	DC- 10 kHz	DC- 10 kHz
Incidental AM	<0.5%	<1%
Stability	±4 Hz	±400 Hz
Linearity	±15 Hz	±1 kHz

3.5.10 Internal Frequency Standard. The Generator shall provide 1 MHz, 5 MHz, or 10 MHz with TTL compatible square wave output at levels up to 3.5 V peak minimum.

3.5.11 External Frequency Reference. The Generator shall be capable of accepting an external frequency of 10 MHz with TTL compatible square wave.

3.5.12 Front Panel Display. The Generator shall have at least seven-digit LED display for frequency and four-digit LED plus sign for voltage with units indicated in MHz, kHz, or Hz, and V, mV, or dB when selected.

3.6 Operating Requirements. The Generator shall provide the following operating capabilities.

3.6.1 Front Panel Control Requirements. All modes and functions shall be operable using front panel controls. The locations and labeling of indicators, controls, and switches shall provide for maximum clarity and easily understood operation without reference to tables, charts, or flow diagrams.

3.6.2 Programmability. All modes and functions shall be fully remotely programmable via the IEEE-488.1 instrumentation bus. When operating the Generator via remote programming, all front panel controls shall be disabled, except for the on / off switch and the Remote / Local switch.

3.6.3 Error Correction. During calibration, the Generator shall provide the capability to correct for all measurement deviations from nominal conditions. This correction capability shall be operational from the front panel control, manual adjustment to printed circuit board, or over the IEEE-488 bus. The Generator shall be capable of changing any calibration factor or other correction data stored in memory of the Generator without removal of any memory circuits or devices. The calibration constants may be changed only if a switch (not a key switch) on the rear panel is enabled.

3.6.4 Local / Remote. The Generator shall have a local and remote operation mode. It shall be either manually or remotely programmable selectable according to paragraph 3.6.2. Manual selection shall be provided by a front panel switch. A means of indicating the operational mode shall be provided. When changing modes, all parameter values shall remain unchanged.

3.6.5 Self-Test. The self-test shall comprise two selectable levels, an operational test to determine if the instrument is operationally ready, and second level diagnostic test to diagnose and isolate faulty field replaceable modules. When the self-test function is initiated, an auto-sequenced internal operation test shall be performed. The diagnostic test shall be selectable only by deliberate operator command.

3.6.6 IEEE Interface. The Generator shall have an IEEE-488.1 interface connector with the following capabilities: AH1, L2, RL1, and E1.

3.7 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.7.1 Calibration Procedure. The manual shall provide a generator calibration procedure in accordance with MIL-M-38793.